1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 31 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 258 minutes

   B. About 190 minutes

   C. About 31 minutes

   D. About 43 minutes

   E. None of the above

---

2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 546 grams of element X and after 4 years there is 78 grams remaining.

   A. About 1825 days

   B. About 1 day

   C. About 730 days

   D. About 365 days

   E. None of the above

---

3. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	90050	90100	90150	90200	90250	90300	90350	90400	90450

A. Non-Linear Power

B. Exponential

C. Logarithmic

D. Linear

E. None of the above

---

4. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 196 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 56 minutes

B. About 338 minutes

C. About 203 minutes

D. About 33 minutes

E. None of the above

---

5. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $170°$ C and is placed into a $12°$ C bath to cool. After 30 minutes, the uranium has cooled to $104°$ C.

A. $k = -0.02047$

B. $k = -0.02486$

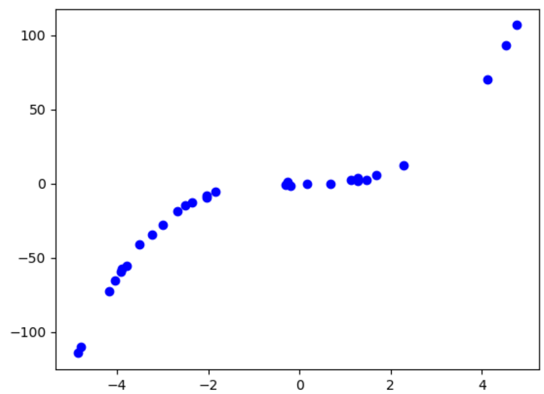
C. $k = -0.02457$

D. $k = -0.01803$

E. None of the above

---

6. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Logarithmic model

C. Linear model

D. Non-linear Power model

E. None of the above

---

7. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is *initially 554 grams of element X and after 4 years there is 110 grams remaining.*

A. About 365 days

B. About 730 days

C. About 1 day

D. About 1460 days

E. None of the above

---

8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $200°$ *C and is placed into a* $16°$ *C bath to cool. After 34 minutes, the uranium has cooled to* $130°$ *C.*

A. $k = -0.01653$

B. $k = -0.02212$

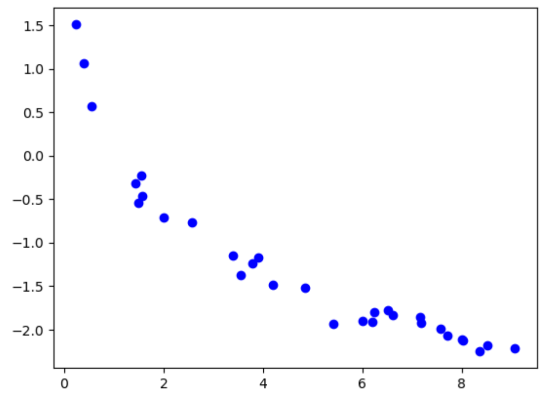
C. $k = -0.03692$

D. $k = -0.02241$

E. None of the above

---

9. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

---

10. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	90000	90013	90021	90027	90032	90035	90038	90041	90043

A. Linear

B. Exponential

C. Logarithmic

D. Non-Linear Power

E. None of the above

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11. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 2 hours, the petri dish has 217 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 185 minutes

B. About 106 minutes

C. About 17 minutes

D. About 30 minutes

E. None of the above

---

12. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 897 grams of element X and after 2 years there is 179 grams remaining.

A. About 1 day

B. About 365 days

C. About 730 days

D. About 0 days

E. None of the above

---

13. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	99965	99925	99885	99845	99805	99765	99725	99685	99645

A. Non-Linear Power

B. Exponential

C. Linear

D. Logarithmic

E. None of the above

---

14. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 2382 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 230 minutes

B. About 38 minutes

C. About 123 minutes

D. About 20 minutes

E. None of the above

---

15. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 160° C and is placed into a 10° C bath to cool. After 12 minutes, the uranium has cooled to 117° C.

A. $k = -0.06410$

B. $k = -0.06479$

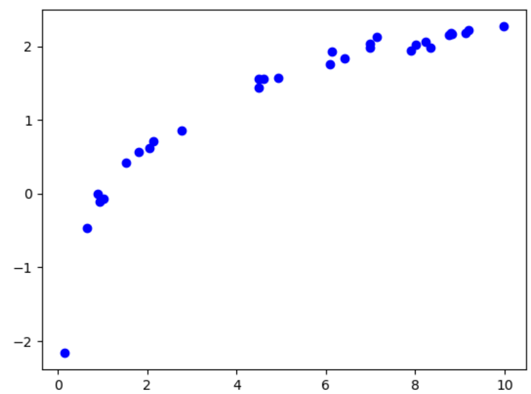
C. $k = -0.11791$

D. $k = -0.03353$

E. None of the above

---

16. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Logarithmic model

D. Exponential model

E. None of the above

---

17. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 740 grams of element X and after 3 years there is 148 grams remaining.

A. About 365 days

B. About 365 days

C. About 1095 days

D. About 1 day

E. None of the above

---

18. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 180° *C and is placed into a* 17° *C bath to cool. After 34 minutes, the uranium has cooled to* 120° *C.*

A. $k = -0.01642$

B. $k = -0.02237$

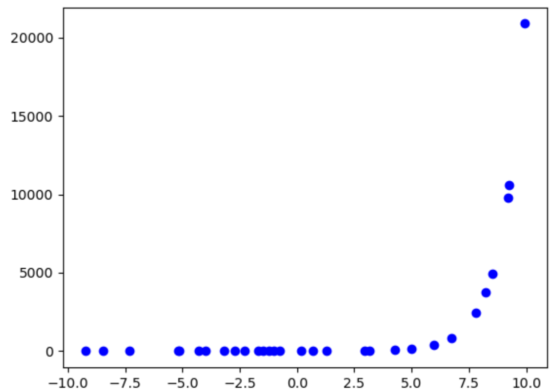
C. $k = -0.03556$

D. $k = -0.02201$

E. None of the above

---

19. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Exponential model

D. Logarithmic model

E. None of the above

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20. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	19972	19938	19904	19886	19852	19818	19784	19766	19732

A. Non-Linear Power

B. Logarithmic

C. Exponential

D. Linear

E. None of the above

---

21. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 4477 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 25 minutes

B. About 153 minutes

C. About 68 minutes

D. About 11 minutes

E. None of the above

---

22. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 573 grams of element X and after 3 years there is 143 grams remaining.

A. About 365 days

B. About 730 days

C. About 1095 days

D. About 1 day

E. None of the above

---

23. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	99970	99940	99910	99880	99850	99820	99790	99760	99730

A. Linear

B. Exponential

C. Non-Linear Power

D. Logarithmic

E. None of the above

---

24. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 6486 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 227 minutes

B. About 22 minutes

C. About 135 minutes

D. About 37 minutes

E. None of the above

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25. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $160°$ C and is placed into a $11°$ C bath to cool. After 29 minutes, the uranium has cooled to $97°$ C.

A. $k = -0.02528$

B. $k = -0.02558$

C. $k = -0.01895$

D. $k = -0.02141$

E. None of the above

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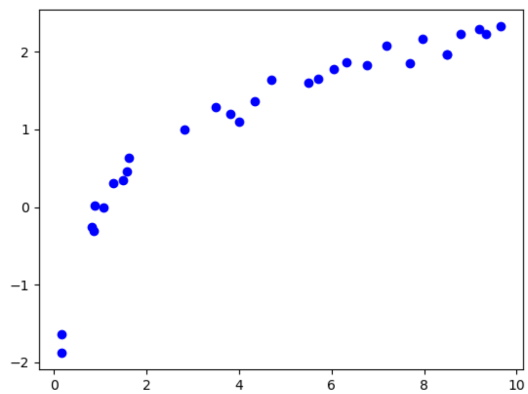
26. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Logarithmic model

D. Exponential model

E. None of the above

---

27. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 539 grams of element X and after 2 years there is 59 grams remaining.

A. About 1 day

B. About 0 days

C. About 0 days

D. About 730 days

E. None of the above

---

28. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 120° *C and is placed into a* 13° *C bath to cool. After 11 minutes, the uranium has cooled to* 80° *C.*

A. $k = -0.05298$

B. $k = -0.06738$

C. $k = -0.04256$

D. $k = -0.06605$

E. None of the above

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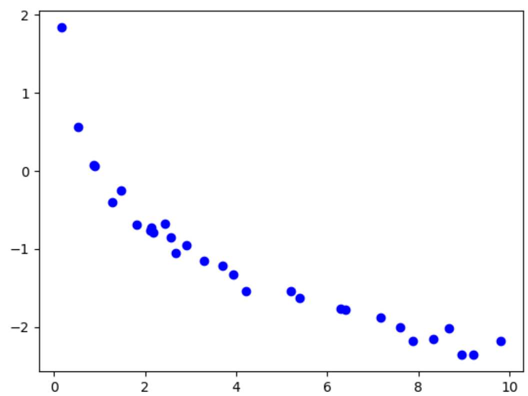
29. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Logarithmic model

D. Linear model

E. None of the above

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30. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	90000	90020	90032	90041	90048	90053	90058	90062	90065

A. Exponential

B. Linear

C. Logarithmic

D. Non-Linear Power

E. None of the above
